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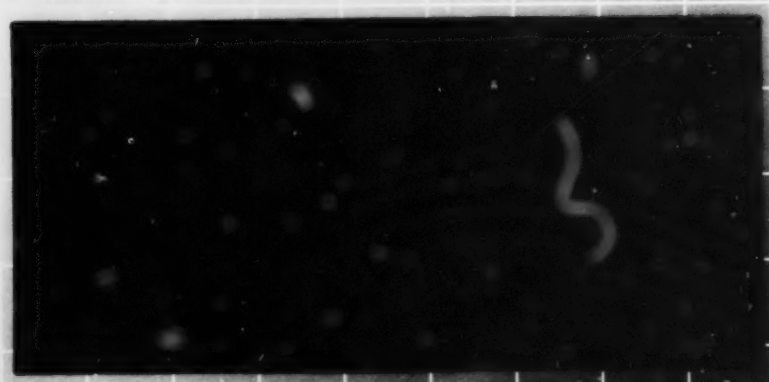

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Private and public monetary returns to schooling in Canada, 1985

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Foreword

More than ever before, the skills of the Canadian workforce will determine individual and collective prosperity. Canadians face the challenge of competing in a globalized world economy. How successfully that challenge is met will be determined by the skills and the brains of the Canadian people.

The Economic Council has examined the Canadian education and training system and has identified some key areas where changes are needed. Our research and conclusions are summarized in the Council Statement, *A Lot to Learn*, published in April 1992.

This working paper, by François Vaillancourt, presents some of the background research to that Statement. It addresses the question of the rate of return to investment in education, both from the point of view of the individual and of society as a whole. Educational attainment has a strong influence on earnings. Indeed, after account is taken of the direct costs of schooling and of forgone earnings, the additional income from completing secondary school yields a rate of return of some 30 per cent for individuals.

This working paper presents estimates of private (individual) and public (social) rates of return for a wide variety of schooling levels and fields of study. It also presents these estimates separately for men and for women. What is striking is the extent of variability in rates of return; even more striking is the finding that among the highest are returns to secondary school completion as compared to dropping out.

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Judith Maxwell
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Introduction

The purpose of this paper is to present private and public rates of return to schooling in Canada by level and by field of study or region of residence. Since rates of return to schooling are often used by both private and public decision makers in allocating resources, it is to be hoped that they will be of interest. The paper is divided into three parts. In the first part, the analytical framework use is discussed and results of previous studies reviewed. In the second part, the data and methodology are described. In the third part, results are presented and analyzed.

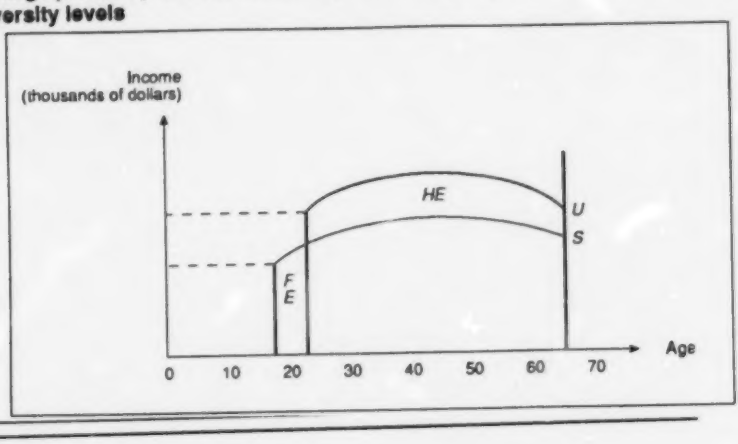
Analytical framework and review of literature

The analytical framework for this study links earnings (labour income) and human capital, and assumes that individuals will acquire additional human capital only if the benefits of doing so are greater than the costs – both in forgone earnings and out-of-pocket expenses. These investment benefits are calculated in earnings, but should include other employment rewards (e.g., fringe benefits, pension rights, less hazardous employment) and non-employment investment benefits such as higher productivity in home production, child-rearing, and good citizenship as well as consumption benefits derived from education. As a result, the benefits from schooling, both from a private or public perspective, are underestimated in this paper. Since all the costs of schooling are included, the rates of return thus obtained are a lower-bound estimate of the full returns to schooling.

Figure 1 summarizes the framework, using arbitrary numerical values. The *S* curve represents the earnings profile of a secondary school graduate, and the *U* curve represents the earnings profile of a university graduate (bachelor's degree level). The area labelled *FE* represents the earnings that a high-school graduate must forgo to attend university. In this figure, it is assumed that these are the only costs – the university student does not hold a summer/part-time job and does not incur out-of-pocket expenses. Alternatively, one could interpret this as equating the out-of-pocket expenses and earnings of that student. One could also add a negative area (below the *X*-axis) to represent these costs (McMahon, 1987). The area labelled *HE* represents the difference between the earnings of the university graduate after graduation, and those of the high-school graduate from the age of graduation from university until retirement. The assumption that the (implied) intercept of *U* is higher than that of S is arbitrary as is the similarity in their slopes. The use of a common ending point to employment income at 65 years of age is also arbitrary, but it is common practice in studies of the return to education since it corresponds to social/legal requirements. It probably leads to a small underestimation of the returns to education, since earnings at that age are heavily discounted.

Figure 1

Earnings profile by level of schooling, secondary and university levels



Once *HE* and *FE* are known, then one can calculate a rate of return, r, such that:

$$\text{present value of university schooling} = 0 = \sum_{i=1}^{42} \frac{(U_i - S_i)}{(1+r)^i} - FE$$

with 42 the number of years employed in this case.

Such a calculation may yield a positive, zero, or negative rate of return, depending on the size of *HE* and *FE*.

There are three possible interpretations of r. The first is the pure human capital model. It assumes that individuals engaging in higher studies are identical in ability to those who do not, and that their studies allow them to acquire additional knowledge. Differences in earnings are then due to differences in human capital. The second option is the abilities approach, where individuals are assumed to differ in terms of ability. In that case, one may be calculating, in part, the returns to ability, with the importance of this return depending on the relative importance of ability and human capital in the determination of earnings. Finally, the third possibility, neglecting ability, is that schooling transmits no knowledge but is used as a screen by employers in the hiring process. In our opinion, the second option best represents reality. We must, however, establish what correction should be made for ability. As Stager (1989, 70) indicates, there are arguments to support both the view that university graduates would have earned more than high-school graduates had

they not gone on to university, and the reverse, depending on how one views the nature of ability. We chose to present rates of return unadjusted for ability differentials and to leave the choice of correcting them to the reader.

Table 1 summarizes the data, methodology, and results of 13 studies of the rates of return to schooling in Canada. Most use census data and calculate rates of return for high school or university in Canada as a whole. Only one study (Stager, 1989) uses the 1986 census data, but it is limited to Ontario.

Methodology and data

Earnings profiles

In this section, we describe the data that were available to us and then discuss the equations estimated with them. Men and women are treated separately, given that their earnings functions usually differ.

This study uses data from the 1986 Statistics Canada Census Individual Microdata File, available to researchers in January 1990. The data were prepared by drawing a 10 per cent sample of the long-form questionnaires that were sent to one fifth of all Canadian households, thus yielding a sample of 500,434 respondents or 2 per cent of the population. In the census, individuals who report earned income must be aged 15 and over. They number 392,680; of these, 260,327 report positive earnings (the sum of wages and salaries and net self-employment income).[1]

This last choice excludes from the sample employable individuals who have chosen to withdraw from the labour force, thus leading to an overestimation of the public rate of return. This is perhaps compensated for by including individuals who work part time by choice, which leads to an underestimation of the rates of return. Note also that some studies (see Stager, 1968, 1989) correct earnings for differences in participation and mortality rates between schooling levels. Not including such corrections reduces the returns to more education, since participation rates go up and mortality rates go down with more schooling.

We study individuals in seven schooling levels that are arrived at by combining information on the highest level of schooling attained and the highest degree held (Table 2). We study seven fields of postsecondary study, regrouped from 12 specific fields. To ensure that the sample is adequate, the four Atlantic provinces were grouped into one region, the Atlantic region, and Manitoba and Saskatchewan were grouped into one region, the Prairies.[2]

Table 1

Summary of Canadian studies of the rates of return to education, 1961-91

Author and year published	Year/ area studied	Rates/ level of schooling studied	Earning data/ assumptions/ methodology	Cost data/ assumptions/ methodology	Tax treatment	Results
Podoluk (1968)	1961, Canada	Private returns; high school and universities; males	1961 census data; labour force members; average earnings per age year; university (U) with respect to high school (HS), HS with respect to elementary (E); corrected for mortality and participation rate	HS: foregone earnings; no summer or part-time work; hypothetical amounts for books ($25) U: foregone earnings; fellowships, summer and part-time earnings accounted for; cost data from a survey of students (Dominion Bureau of Statistics)	None	Private returns HS: 16.3 per cent U: 19.7 per cent
Stager (1968)	1961, Ontario	Private and social rates of return; universities and nondegree institutions by field of study/occupation; males and females	1961 census data; average earnings by occupation for Canada and surveys of recent graduates (National Employment Service); average earnings available as 10-year means; yearly data calculated, corrected for mortality and participation rate	Institutional costs averaged over 1960-64 and deflated to 1960-61; Ontario government weights used to allocate them by fields; books and other cost data from a survey of students (DBS); forgone earnings are from Podoluk	Yes, using average income tax paid at various income levels	Social returns, all, U, 8.6-12.5 per cent, private returns, all U 11.0-15.4 per cent, returns for 28 fields/ occupations also available
Dodge and Stager (1972)	1966, Canada	Private and social rates of return; science and management; bachelor's, master's, and Ph.D. levels, males; private, public, and all employers	1967 survey of highly qualified manpower, Department of Manpower and Immigration; yearly earnings calculated by quadratic fit of mean earnings by age group	Ontario institutional costs for 1965-66; forgone earnings corrected for part-time earnings; cost data from a survey of students	Not stated	Social returns vary from −10.0 to 7.5 per cent; private rates of return range from −10.0 to 16.3 per cent

Crean (1972)	1961, 10 provinces	"Expected" private rates of return; high school; males, females, and both	1961 census data; exact data fit not described; corrected for participation and mortality rates	Forgone earnings from census; forgone part-time earnings set at 20 per cent of full-time earnings; $25 cost hypothesized for books	Yes, using average tax paid at various income levels	Private rates of return range from 5.8 to 11.3 per cent for all individuals
Mehmet (1977)	1961, 1969, 1972, Canada	Private rates of return; bachelor's degrees; 21 fields; all Canadians	Initial salaries of graduates from University Career outlook; earnings profile for 1961 from Podoluk; earning profile for 1969 and 1972 interpolated using ten-year interval mean incomes by age	Forgone earnings from Podoluk (1961) or 1971 census (1969 or 1972) calculated for 32 weeks to adjust for part-time and summer earnings; fees of the six largest Canadian universities; direct costs neglected (set to zero)	Not stated – probably none (Podoluk)	Private mean rates of return are 14 per cent in 1961, 22 per cent in 1969; and 18 per cent in 1972
Bélanger and Lavallée (1980)	1979, Quebec	Private rates of return; four occupations: computer science, nursing, nutrition, social work; bachelor's versus CEGEP	1979 collective agreements used to project earnings streams	Schooling costs from Statistics Canada	No	Private rates of return to bachelor's versus CEGEP degrees range from 5 per cent (nursing) to 19 per cent (social work)
Cousineau (1984)	1979; Quebec; cities with populations 100,000+	Private and social rates of return; bachelor's, master's and Ph.D's	1979 SCF, economic families micro data files; earning profiles calculated using regression analysis; some analyses adjust earnings for fringe benefits	Various hypotheses used to account for forgone earnings and direct costs	Yes, using a regression method	Private rates of return for bachelor's degrees range from 10.3 to 14.0 per cent; public rates are in the order of 8 per cent
Vaillancourt and Henriques (1986*a*)	1981, Atlantic prov., Quebec, Ontario, Prairies, B.C.	Private and social rates of return; university males who attended	1982 survey of consumer finance (SCF) individual microdata file (1981 earnings); earnings profiles; calculated using regression analysis; productivity changes examined	Forgone earnings set at 2/3 of earnings of nonuniversity degree holders; fees are an average for each region; direct costs from a Council of Ministers of Education survey	Yes, using a tax simulation program	Private rates of return range from 7 to 14 per cent, public rates of return from 6 to 10 per cent
Vaillancourt and Henriques (1986*b*)	1980 and 1981 Quebec	Private and social rates of return; CEGEP degrees; general/professional; males and females	1982 SCF and 1981 census public use sample tape; earnings profiles (1980) calculated using regression analysis	Forgone earnings set at 2/3 of earnings of nonholders of college degrees; no tuition fees charged in Quebec; direct costs are from the survey used by authors (1986*a*)	Yes, using a tax simulation program	Private rates of return range from 2 to 15 per cent, public rates of return from 1 to 11 per cent

Table 1 (cont'd)

Author and year published	Year/ area studied	Rates/ level of schooling studied	Earning data/ assumptions/ methodology	Cost data/ assumptions/ methodology	Tax treatment	Results
Cousineau and Vaillancourt (1987)	1980; 9 prov. (P.E.I. excluded)	Private and social rate of return	1981 census public use sample tape; earnings profiles (1980) calculated using regression analysis	Forgone earnings from census data; part-time earnings assumed equal to fees and direct expenses	Yes, using a tax simulation program	Private rates of return range from 7.5 to 22 per cent, public rates of return from 3.2 to 13.7
Vaillancourt, Carpenter, and Henriques (1987)	1980; Canada	Private and social rates of return; males; first university degree	1981 census public use sample tape; earnings profiles (1980) calculated using regression analysis	Forgone earnings, fees; and direct costs set as in Vaillancourt and Henriques (1986, *a*, *b*)	Yes, using a tax simulation program	The private and public rates of return are 6 per cent
Stager (1989)	1985; Ontario	Private and social rates of return; males and females; bachelor's and first professional degree, by occupation (12)	1986 census; mean earnings by year of age; corrected for participation and mortality rates	Forgone earnings from census data; fees and direct costs from survey data; basic income units are used to establish program costs	Yes, using average income tax paid at various income levels	Private rates of return are 14 per cent for men and 15.2 per cent for women; public rates are 12.1 and 11.8 per cent
Stager (1989)	1970 and 1980; Ontario	Private and social rates of return; males; university graduates	1971 and 1981 census, mean earnings by year of age; corrected for participation and mortality rates	Forgone earnings from census data, fees and direct costs from survey data; basic income units are used to establish program costs	Yes, using average income tax paid at various income levels	Private rates of return were 12.2 per cent in 1970 and 9.9 per cent in 1980; public rates were 10.8 and 7.9 per cent
Constantatos and West (1991)	1980; Canada	Social rates of return; males; Canada; elementary; high school and bachelor's degree; adjustments for costs of public funds and ability	1981 census; mean earnings by year of age; corrected for attendance	Forgone earnings from census data; costs from Statistics Canada data	No – not applicable	Private and public rates of return decrease as ability differentials and the deadweight costs of public funds increase

Table 2

Definitions of schooling levels and fields of study

	Comments	1986 census PUST variables and codes (DGREE)	(HLOSP)
Schooling levels			
Elementary complete	Grades 5-8	1	2
Secondary certificate	Graduation certificate	2	4
College	CEGEPS or community colleges	4	8
Bachelor's degree		6	11
Health degree	Medicine, dentistry, optometry, veterinary medicine	8	11
Master's degree		9	11
Ph.D.		10	11
Fields of study		(DGMES)	
Education		1	
Humanities	Fine arts, humanities	2 or 3	
Social sciences		4	
Commerce		5 or 6	
Pure sciences	Agriculture, biological, pure and mathematical sciences	7 or 12	
Engineering	Engineering and applied sciences	8 or 9	
Health sciences	Nursing, health professions, and sciences	10 or 11	

Source Compiled by the author from various sources.

We estimate the following equation, using ordinary least squares:

$$\ln(\text{earnings}) = B_0 + B_1\text{Age} + B_2\text{Age}^2 + \left[\sum_{i=1}^{7} B_{i3}\text{Fields} + \sum_{i=2}^{7} B_{i4}\text{Fields} \times \text{Age}\right].$$

We use a semilogarithmic form with a concave relationship between earnings and age to estimate returns by level of study. When we take into account the fields of study at the university level, we add the terms in brackets. The seven dichotomous variables of the fields of study modify the intercept, and interacting with the age variable, they modify the slope of the equation.

The regression results used in the study are presented in Tables A-1 to A-9 (Appendix A). In general they can be summarized as follows:

- Age earnings profiles are concave, with peaks reached in most cases by the age of 40-50;

- The R^2s tend to be higher for secondary schooling than for lower (elementary) or higher (postsecondary) levels of schooling; and

- The R^2s tend to be higher for men than for women in a given level of schooling.

We use both gross earnings (i.e., earnings before income taxes) and net earnings to calculate public and private rates of return. We thus assume that gross earnings measure the individual's contribution to society and net earnings represent what the individual keeps.

Since earnings include both wages, salaries, and net self-employment income, a small part of earnings represents the net returns to nonhuman capital used by the self-employed. It is a small amount because it is a part of self-employment income, which itself represents a small proportion of earnings. The only way to exclude this kind of income, given the data available, is to omit individuals with self-employment income. This would lead to serious biases in the estimation of the returns to education in fields of study whose graduates often engage in self-employment. This is particularly true for holders of health degrees (e.g., M.D.), but also applies to holders of other degrees, such as engineering.

We estimate the earnings equations using 1986 census microdata to project the earnings profile over the working lives of individuals, assuming that it is possible to account for inflation (if any) in the tax system so as to leave real earnings unchanged. We also assume that there is no general increase in productivity through time. Such an increase would result in an upward drift in all earnings profiles. Taking into account either the imperfect correction for inflation by an indexed income tax system or a reasonable level of growth in productivity would not strongly alter our results (Vaillancourt and Henriques 1986).

A more fundamental problem is that we are using single-year (cross-sectional) results to represent lifetime employment income. This is both unavoidable and common practice in this kind of study, given the lack of longitudinal data in Canada and most other countries. Fortunately, 1985 was neither highly recessionary (as was 1982) or expansionary (as was 1984) and is thus reasonably representative of the 1980s, with the unemployment rate at 10.5 per cent being almost equal to the five-year mean in 1983-87 of 10.4 per cent.[3]

Gross earnings are calculated by entering the appropriate ages in the equations and the field of study/age impacts, but only for significant coefficients ($t > 1.645$). To do this, both the starting and ending ages of the various age-earnings profiles must be specified. The starting ages were ascertained through a combination of analysis of the data and information on the usual length of schooling.[4] The ending age was set at 64, which assumes that all individuals retire on their 64th birthday and do not work in their 65th year.

The earnings at the time of the census of all individuals with the relevant level and type of schooling are calculated. Unfortunately, information on school attendance was not collected in the 1986 census. As a result, it is not feasible to separate individuals still attending school from those who are not. This means that the earnings of those with schooling above the elementary level underestimate the returns to regular employment for a given level of schooling, since the earnings of individuals studying for a higher level of schooling are taken into account in these calculations. While both sets of coefficients in a comparison such as that of the university and the secondary levels are affected, it is not certain that these effects cancel each other out. If the proportion of individuals with a given level of schooling that are studying for a higher-level degree decreases with an increase in that level of schooling, this could lead to an upward bias in the rate of return as schooling increases.

One solution to this problem is to restrict the study to individuals who were employed full-time (48 weeks or more) in 1985. By doing this, however, one would be neglecting the fact that the unemployment rate decreases with schooling, which is one of the determinants of the returns to schooling. This would bias downward all rates of return to schooling.

Net earnings are calculated by subtracting personal income taxes from gross earnings. Tax burdens were calculated for each gross earnings profile using a computerized, simplified version of the 1985 tax return. The following assumptions were made :

- All taxpayers claim the personal exemption. They also claim the employment expense deduction, the Canada/Quebec Pension Plan and unemployment insurance premium deductions, and a combined Registered Retirement Savings Plan/Registered Pension Plan deduction.

- Federal and Quebec income tax rates and specific provincial rates are used – (Ontario – 0.48 per cent; Alberta – 0.435 per cent; British Columbia – 0.44 per cent). Unweighted means of relevant rates are used for the Atlantic region (0.5675 per cent) and Prairie region (0.5225 per cent). The Ontario rate is used for the calculation of the rate for Canada.

- The federal general tax reduction ($100) and surtax (2.5 per cent), the Quebec general tax reduction (3 per cent) and the Ontario, Alberta, and British Columbia tax reductions are taken into account.

Costs of schooling

The public cost of schooling is the resources required by the economy to produce a given amount of schooling, and the private cost is the resources expended privately by the individual receiving that amount of schooling. In Canada, the public cost of a given amount of schooling is significantly higher than the private cost, because education is publicly subsidized. The share of private cost increases, however, with the level of schooling. The public and the private costs can be broken down into two major components: forgone earnings and out-of-pocket expenses. For public costs, gross earnings are used, while for private costs, net earnings are used. For out-of-pocket expenses, the student-related income of universities from public subsidies and tuition fees and the direct costs to students of books and supplies should be included to calculate public costs. Public subsidies should not be included in calculating private costs. Note that food and housing costs such as residence fees should not be included, since these costs are incurred by students and nonstudents alike.[5]

In this study, annual gross and net forgone earnings are calculated using the earnings equations found in Tables A-1 to A-9; the appropriate months of summer work was determined by the length of the academic year. Forgone earnings are estimated using the annual earnings for the appropriate lower level of schooling multiplied by the portion of the year worked. Data on annual out-of-pocket expenses are obtained for 1985-86 from a variety of sources. Most of these sources provide annual data for the 1980-90 period. A comparison of the data for 1985-86 with that for surrounding years indicates that 1985-86 is a normal year for the period.

No data were available on the expenses of books, supplies, etc., for the elementary, secondary, and college levels. Therefore, these expenses were assumed to equal to $100 per year of elementary study, $200 per year of secondary schooling, and $300 per year of college-level study in all regions (1985 dollars). Data are available on the expenses of Canadian university students by province for the year 1983-84. There is no differentiation between expenses for undergraduate and graduate students or between those for students in different fields of study. Nonfee costs to students are presented in Table 3.

There are no tuition fees for elementary and secondary school students attending public schools in Canada. Private schools and colleges charge tuition fees, but these are not considered here. College fees vary according to

Table 3

Nonfee costs to students in four levels of study, Canada and regions, 1985-86[1]

	Atlantic	Quebec	Ontario	Prairies	Alberta	British Columbia	Canada
				(1985 dollars)			
Elementary	100	100	100	100	100	100	100
Secondary	200	200	200	200	200	200	200
College	300	300	300	300	300	300	300
University	882	786	925	921	1,025	953	915

1 An unweighted sum of the amounts for the relevant provinces is used to compute the expenses for the Atlantic and Prairie regions and for Canada as a whole. The data are converted to 1985 dollars using the change in the overall level of the Consumer Price Index from December 1984 (124.1) to December 1985 (129.5) yielding an increase of 4 per cent.

Source Elementary, Secondary, College – amounts assumed. University – *Profil des étudiants du niveau postsecondaire au Canada*, Secrétariat d'État et Statistique Canada, Table 14, p. 35, sum of columns 3 and 6 (Dépenses relatives aux études et autres dépenses liées aux études).

the program (Stokes 1988: 125). Given our goal, we derived college fees from a ratio of college/university fees. Finally, university fees are averages of actual fees for 1985-86. Tuition fees are summarized in Table 4.

The data on public costs reported here are gathered by Statistics Canada.[6] Some costs, such as depreciation property tax relief or forgone investment income, are not accounted for, or are not accounted for in a way that is strictly comparable between provinces.

The cost per student is broken down by province, but is not broken down into elementary and secondary costs. To calculate these costs, we used the following formula:

$$\text{Expenditure, per elementary/ secondary student} = \left[\text{Expenditure per elementary student} \times \frac{\text{Number of elementary students}}{\text{Number of elementary and secondary students}}\right] + \left[\text{Expenditure per secondary student} \times \frac{\text{Number of secondary students}}{\text{Number of elementary and secondary students}}\right]$$

and postulated the relationship between primary and secondary expenditure to be: primary cost = 0.75 secondary cost.[8] Public costs are summarized in Table 5.

The cost of community college/CEGEP studies was calculated with the following formula[9]:

$$\frac{\text{Expenditure on postsecondary (nonuniversity) education}}{\text{Full - time students} + 1/3\,(\text{part - time students})}.$$

The cost per university student is available only as an aggregate, with all levels and fields combined. To break it down by level and field of study, the following cost ratios, derived using information on the cost by level and field of study in Ontario,[10] are assumed to hold for all provinces:

- Bachelor's degree level: education, humanities, social sciences, commerce, mathematics and pure sciences – 1 (reference point); engineering – 2; health – 5;

Table 4

Tuition fees for four levels of study, Canada and the regions, 1985-86

Level and field of study	Atlantic	Quebec	Ontario	Prairies	Alberta	British Columbia	Canada
				(Dollars)			
Elementary[1]	0	0	0	0	0	0	0
Secondary[1]	0	0	0	0	0	0	0
College[2]	503	126	547	527	463	769	437
Undergraduate studies[3]							
Education	1,488	506	1,199	968	859	1,456	1,079
Humanities	1,393	518	1,199	1,045	853	1,588	1,099
Social sciences	1,393	518	1,199	1,045	853	1,588	1,099
Commerce	1,377	478	1,202	1,063	857	1,410	1,065
Pure sciences	1,375	505	1,244	1,015	859	1,456	1,076
Engineering	1,451	517	1,297	1,120	1,057	1,526	1,161
Health	1,501	586	1,561	1,430	1,407	2,200	1,463
All fields	1,438	518	1,272	1,098	964	1,603	1,149
Graduate studies[3]							
All fields	1,281	473	1,297	1,168	1,748	1,750	1,286

1 Elementary and secondary fees are set to zero.

2 College fees were calculated as follows: first, a community college/university fee ratio for 1983-84 for Canada as a whole and for the four regions [Atlantic, Quebec, Ontario, West (Prairies, Alberta, British Columbia)] for which Stokes (1988, 124-5) reports data was calculated. The data used by Stokes are taken from the 1984 *Survey of Post Secondary Students* carried out by Statistics Canada (1988, 103). The ratio for Canada is calculated using simple means of male and female tuition and required fees. These ratios are: Canada – 0.38; Atlantic – 0.35; Quebec – 0.24; Ontario – 0.43; Prairies – 0.48; Alberta – 0.48; British Columbia – 0.48. Second, these ratios were applied to university tuition fees and yielded the college tuition fees.

Table 4 (cont'd)

3 University fees were calculated as follows: *Tuition Fees and Living Accommodation Costs at Canadian Universities*, Statistics Canada (81-219), Table 1, 1985-86. Data for Manitoba are the total of standard and faculty fees. In terms of line items of Table 1, the Atlantic corresponds to lines 1-3, 5, 11, 13-17, Quebec to lines 19-24, Ontario to lines 25-28, 29-41, the Prairies to lines 44, 47, 50-53, 55, and British Columbia to lines 56, 58 and 60. In the Atlantic region, Cape Breton University, Kings College, Mont Saint Vincent, Nova Scotia Agricultural College, Nova Scotia College of Art and Design, Université Sainte Anne and Saint Mary's University were excluded. In Quebec, Bishops University, and in Ontario, the College dominicain de philosophie et de théologie are excluded. In the Prairies, the College universitaire de Saint Boniface (Manitoba) and in Alberta, Camrose Lutheran College are excluded. Finally, in British Columbia, the Seminary of Christ the King and Trinity Western University are excluded. Fees for university students were calculated as the unweighted means of fees at major universities in each region. Fees for undergraduate education, commerce, engineering and science studies, and graduate (M.Sc.; Ph.D.) studies are taken directly from the table. Fees for humanities and social sciences are those for art degrees. Fees for health degrees are those for medicine. Canadian fees are an unweighted mean of provincial fees for the appropriate field of study.

Source Calculations by the author.

Table 5

Public expenditure per student, for four levels of study, Canada and the regions, 1985[1]

	Atlantic	Quebec	Ontario	Prairies	Alberta	British Columbia	Canada
				(Dollars)			
Level and field of study:							
Elementary	3,149	4,777	4,023	3,812	4,096	3,562	4,044
Secondary	4,198	6,370	5,364	5,082	5,461	4,759	5,391
College	9,351	6,098	6,482	13,448	11,428	7,675	7,001
University							
Bachelor's							
Education/Commerce/Social sciences/Humanities	9,265	8,473	8,338	9,208	10,431	9,847	8,736
Engineering/Sciences	18,530	16,946	16,666	18,416	20,862	19,694	17,472
Health	46,325	42,365	41,665	46,040	52,155	49,235	43,680
All fields	13,898	12,710	12,507	13,812	15,465	14,771	13,104
Master's							
Education/Commerce/Social sciences/Humanities	18,530	16,946	16,666	18,416	20,862	19,694	17,472
Engineering/Sciences/Health	27,795	25,419	24,999	27,624	31,293	29,451	26,208
All fields	23,163	21,183	20,833	23,020	26,078	24,573	21,840
Ph.D.							
All fields	55,590	50,838	49,958	55,248	62,586	59,082	52,416

1 The annual cost for a bachelor's degree in all fields is 1.5 times the cost of a bachelor's degree in education, commerce, social sciences, and humanities. The annual cost for a master's degree in all fields is the mean of the costs of both specific master's degrees.

Source Compiled by the author from various sources.

- Master's degree level: education, humanities, social sciences, commerce – 2; mathematics and pure sciences, engineering, health – 3; and

- Ph.D. level: all disciplines – 6.

Using these cost ratios, enrollment information,[11] and overall costs,[12] and using a formula similar to the one used for elementary/secondary students (but with six terms instead of two), one can derive the costs per level/field of study.

For both forgone earnings and out-of-pocket expenses, annual costs are added up for the relevant number of years without present-value calculations. These aggregate costs are reported in Tables A-10 to A-15 (Appendix A). Elementary schooling is assigned a length of six years; incomplete high school a length of three years; high school a length of six years (three more); community college a length of three years (after high school); bachelor's degree a length of four years (after high school); master's degree a length of two years (after a bachelor's degree); health degree a length of six years (after high school); and Ph.D. a length of four years (after a master's degree). These lengths of time are assumed to be uniform across regions to facilitate comparisons.

Finally, the rates of return obtained from combining the earnings profiles of individuals living in a given province on 4 June, 1986 (the date of the census) with the costs of schooling in that province in 1985-86 are calculated. This implies not only that individuals completed their studies in the standard length of time, but also that they acquired their last two levels of schooling in the province in which they resided in 1986 (or in a province with similar costs). This can lead to mismeasurement of the rate of return if, for example, an individual moves from a low cost/low earnings to a high cost/high earnings region, or vice versa, after completing school. The available mobility data does not allow us to control for this.

Returns to schooling

In this part, we present results by levels of schooling for Canada as a whole. We then disaggregate these results by region for high-school graduates and holders of a bachelor's degree or by fields of study at the bachelor's degree level. The disaggregations were selected on the basis of both sample size and potential interest to the reader. Table 6 presents results for Canada as a whole. Private rates of return are higher than public rates of return – even with a progressive income tax system – indicating the importance of public funding in this field. Rates of return for the high-school level are higher than postsecondary schooling, and there is a tendency for returns to schooling to decline

with the level of schooling – a result common in this type of study. Finally, it shows generally higher rates of return for postsecondary schooling for women than for men, presumably because of women's relative scarcity at that level of schooling in past years.

Table 6

Summary of assumptions used in the study

Assumptions	Comments/bias
1) Benefits measured by differences in earnings only	Fringe (employment), nonmarket production, child rearing, and consumption benefits are neglected. Large negative bias
2) All monetary costs are included	Idem
3) No correction for differences in ability	Uncertain impact
4) Individuals with no employment income are excluded, while those working part time by choice are included	Positive and negative bias: overall impact uncertain
5) Definition of earnings as wages + self-employment income	Lack of correction for returns to nonhuman capital used by the self-employed – small positive bias
6) No correction for differential participation rate by level of schooling	Negative bias more important for women
7) No correction for differential mortality rate (same retirement age) by level of schooling	Small negative bias
8) Income tax fully indexed. Excess burden of taxes not taken into account	Small positive bias for private rates of return
9) No productivity growth	Negative bias
10) Individuals attending school included	Possible positive bias
11) Province of work/residence in 1986 assumed to be province of last two levels of study	Given Canadian migration and cost patterns, this could lead to a negative bias

Since education is a provincial responsibility in Canada, it is appropriate to present rates of return on a provincial, or at least a regional basis. Table 7 reports the returns to completing high school rather than dropping out. These returns are presented instead of those associated with a comparison with elementary schooling because they are more relevant; given the laws on compulsory schooling.

Regional variations in rates of return reflect, in part, employment opportunities in the various sectors of the economy. Table 8 presents the rates of return to a bachelor's degree across Canada. Even with the presence of two outliers, British Columbia for men and the Atlantic provinces for women, these rates of return are less dispersed than rates of return to secondary education, reflecting the greater mobility of these individuals. The rates of return for males are similar to those reported by Vaillancourt and Henriques (1986a) for males, by region, in 1980.

The regional dispersion of returns to university schooling is one relevant aspect of the level of schooling (Table 9). Another is the dispersion between fields of study of the returns to university schooling. Table 10 presents evidence for bachelor's degrees and health degrees (M.D., D.V.M., D.D.S.). Not surprisingly, the highest private rates of return are obtained by those holding health degrees while the lowest are obtained by holders of bachelor's degrees in the humanities. The relatively high returns to the social sciences compared to, say, pure sciences are due, in part, to the inclusion of lawyers in that group (due to the data). Gender differences in private rates of return for a given field, such as engineering, may reflect differences in the choice of subspeciality or aversion to risk.

Conclusion

This paper has presented a set of rates of return to schooling in Canada for 1985. The results show the importance of completing a minimum level of schooling (high school), a decrease in rates of return to schooling with an increase in the level of schooling, some interregional variation in these rates of return, and important, but expected, differences among fields of study.

Table 7

Private and public rates of return to various levels of schooling, by gender, Canada, 1985

	Level of schooling					
	Secondary[1]					
	I	II	College[2]	Bachelor's[2]	Master's[3]	Ph.D.[4]
	(Per cent)					
Males						
Private	20.7	33.4	6.6	8.3	6.5	1.2
Public	10.6	11.9	–2.0	4.3	2.4	–2.3
Females						
Private	18.6	38.5	17.3	18.8	0.1	16.3
Public	6.1	9.1	5.4	8.4	–4.9	2.5

1 Secondary (I) – compared with elementary schooling. Secondary (II) – compared with incomplete secondary schooling.
2 College and bachelor's compared with completed secondary schooling.
3 Master's compared with bachelor's.
4 Ph.D. compared with master's.
Source Calculations by the author.

Table 8

Private and public rates of return for those completing secondary schooling in the regions, by gender, 1985[1]

	Atlantic	Quebec	Ontario	Manitoba/ Saskatchewan	Alberta	British Columbia
			(Per cent)			
Males						
Private	32.1	19.5	36.3	45.6	33.5	46.2
Public	13.7	5.4	13.6	17.1	11.4	15.0
Females						
Private	22.5	35.6	37.6	55.2	46.8	53.0
Public	2.1	8.6	9.4	13.4	10.9	11.4

1 Compared with incomplete secondary schooling. Work starting ages: secondary school completed – 18; secondary school abandoned – 15.

Source Calculations by the author.

Table 9

Private and public rates of return to all bachelor's degrees in the regions, by gender, 1985[1]

	Atlantic	Quebec	Ontario	Manitoba/ Saskatchewan	Alberta	British Columbia
				(Per cent)		
Males						
Private	14.3	14.0	10.4	8.4	14.7	5.3
Public	7.3	8.9	6.6	5.7	8.3	2.6
Females						
Private	25.0	13.7	15.2	12.8	14.9	14.3
Public	9.0	5.7	6.0	5.0	4.8	4.9

1 Compared with completed secondary school.
Source Calculations by the author.

Table 10

Private and public rates of return to bachelor's degrees by field of study and gender, Canada, 1985[1]

	Education	Humanities	Social sciences	Commerce	Natural sciences	Engineering	Health sciences	Health degree
				(Per cent)				
Males								
Private	9.8	0.7	10.8	19.6	10.6	23.0	9.2	30.8
Public	5.8	–0.1	8.8	13.5	5.9	11.7	–0.7	9.3
Females								
Private	16.3	5.5	16.3	23.9	16.3	16.0	26.6	28.8
Public	8.5	1.9	8.5	11.9	5.1	5.1	3.0	6.8

1 Compared with completed secondary school. Only coefficients significantly different from zero ($t > 1.65$) were used.

Source Calculations by the author.

Appendix A

Table A-1

Regression results for schooling level and employment income, males, Canada, 1985.[1]

	Elementary		Secondary certificate	Community college/CEGEP	Bachelor's degree	Master's degree	Health degree	Ph.D./ doctorate
	Completed	Incomplete						
Variable:								
Constant	5.4842 (68.94)	3.9981 (109.66)	4.8766 (91.19)	5.4327 (68.42)	4.8473 (56.32)	5.1951 (24.86)	5.8075 (20.86)	5.8541 (13.60)
Age	0.1779 (49.92)	0.2701 (130.35)	0.2395 (80.01)	0.2182 (52.50)	0.2442 (56.59)	0.2288 (23.94)	0.2265 (18.22)	0.1923 (10.74)
Age^2	–0.0018 (–47.70)	–0.0029 (–111.95)	–0.0026 (–69.10)	–0.0024 (–47.26)	–0.0026 (–50.26)	–0.0024 (–22.51)	–0.0023 (–17.76)	–0.0019 (–10.29)
R^2	0.1466	0.4107	0.3367	0.2356	0.2614	0.1514	0.2440	0.1071
F	1,278.9943	12,275.4615	4,550.4391	1,738.0116	2,169.9651	102.2653	167.7127	60.3989
N	14,875	35,230	17,925	11,274	12,256	3,557	1,034	991

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-2

Regression results for schooling level and employment income, females, Canada, 1985[1]

	Elementary		Secondary certificate	Community college/CEGEP	Bachelor's degree	Master's degree	Health degree	Ph.D./ doctorate
	Completed	Incomplete						
Variable:								
Constant	6.2206 (47.33)	4.8210 (101.76)	5.9330 (89.90)	6.7933 (81.88)	6.0395 (50.41)	5.9117 (16.74)	4.9097 (6.94)	6.1041 (6.32)
Age	0.1068 (17.96)	0.1913 (71.23)	0.1561 (42.04)	0.1262 (28.22)	0.1688 (26.64)	0.1770 (10.58)	0.2519 (7.09)	0.1825 (4.25)
Age^2	–0.0011 (–16.44)	–0.0021 (–59.77)	–0.0018 (–36.60)	–0.0015 (–26.21)	–0.0018 (–23.50)	–0.0019 (–9.86)	–0.0027 (–6.48)	–0.0019 (–4.20)
R^2	0.046	0.2324	0.1165	0.0565	0.0891	0.0689	0.1693	0.0746
F	185.3310	4,030.0840	1,207.4177	442.9040	472.2718	63.1210	29.9444	9.0555
N	7,597	26,624	18,305	14,761	9,637	1,679	285	201

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-3

Regression results for schooling level and employment income, by gender, Atlantic region, 1985[1]

	Males			Females		
	Secondary incomplete	Secondary certificate	Bachelor's degree	Secondary incomplete	Secondary certificate	Bachelor's degree
Variable:						
Constant	3.9296 (30.15)	4.2417 (19.64)	4.3066 (12.32)	4.8541 (31.77)	5.3197 (19.48)	5.4958 (12.11)
Age	0.2603 (35.52)	0.2664 (21.83)	0.2730) (15.35)	0.1731 (20.16)	0.1684 (10.88)	0.1956 (7.85)
Age^2	–0.0028 (–30.26)	–0.0030 (–19.02)	–0.0030 (–14.03)	–0.0018 (16.49)	–0.0019 (–9.32)	–0.0022 (–6.83)
R^2	0.3678	0.3547	0.2592	0.2221	0.1377	0.1084
F	945.9377	325.0016	139.4141	345.2749	85.2262	45.3859
N	3,249	1,180	792	2,413	1,056	731

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-4

Regression results for schooling level and employment income, by gender, Quebec, 1985[1]

	Males			Females		
	Secondary incomplete	Secondary certificate	Bachelor's degree	Secondary incomplete	Secondary certificate	Bachelor's degree
Variable:						
Constant	4.7374 (48.10)	5.0679 (51.55)	4.7377 (26.20)	5.5604 (39.84)	6.0795 (44.34)	5.5518 (24.05)
Age	0.2344 (43.12)	0.2240 (42.01)	0.2458 (26.94)	0.1605 (20.77)	0.1505 (19.86)	0.1841 (14.86)
Age^2	–0.0025 (–37.11)	–0.0024 (–36.16)	–0.0025 (–23.37)	–0.0018 (–17.98)	–0.0017 (–17.48)	–0.0020 (–12.69)
R^2	0.3037	0.3190	0.2849	0.1328	0.0937	0.1311
F	1,363.8681	1,276.3781	546.7399	308.4918	266.4573	167.0427
N	6,250	5,447	2,741	4,016	5,135	2,203

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-5

Regression results for schooling level and employment income, by gender, Ontario, 1985[1]

	Males			Females		
	Secondary incomplete	Secondary certificate	Bachelor's degree	Secondary incomplete	Secondary certificate	Bachelor's degree
Variable:						
Constant	3.7292 (70.32)	4.5852 (54.20)	4.7679 (36.80)	4.6999 (68.30)	5.6815 (59.54)	6.0178 (32.66)
Age	0.2853 (94.06)	0.2566 (53.30)	0.2492 (38.60)	0.1981 (50.31)	0.1702 (31.50)	0.1712 (17.58)
Age^2	–0.0031 (–79.86)	–0.0028 (–45.67)	–0.0026 (–34.56)	–0.0021 (–41.75)	–0.0019 (–27.34)	–0.0019 (–15.60)
R^2	0.4894	0.3799	0.2762	0.2721	0.1544	0.0929
F	6,711.1291	2,106.2080	977.3951	2,085.5225	684.5282	199.4271
N	14,004	6,874	5,118	11,154	7,491	3,875

1 *t*-statistics are in brackets.

Source: Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-6

Regression results for schooling level and employment income, by gender, Prairie region, 1985[1]

	Males			Females		
	Secondary incomplete	Secondary certificate	Bachelor's degree	Secondary incomplete	Secondary certificate	Bachelor's degree
Variable:						
Constant	4.4055 (38.16)	5.4329 (25.90)	5.3177 (17.48)	4.9505 (31.91)	6.4359 (24.36)	5.8443 (12.56)
Age	0.2453 (38.31)	0.2168 (18.49)	0.2170 (14.06)	0.1834 (21.06)	0.1388 (9.22)	0.1854 (7.44)
Age^2	–0.0026 (–33.25)	–0.0024 (–16.56)	–0.0022 (–12.13)	–0.0020 (–18.21)	–0.0017 (–8.59)	–0.0022 (–6.91)
R^2	0.3535	0.2749	0.2575	0.1864	0.0782	0.0763
F	1,001.8442	210.8901	145.2829	311.6270	46.1095	30.4938
N	3,662	1,108	833	2,712	1,064	715

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-7

Regression results for schooling level and employment income, by gender, Alberta, 1985[1]

	Males			Females		
	Secondary incomplete	Secondary certificate	Bachelor's degree	Secondary incomplete	Secondary certificate	Bachelor's degree
Variable:						
Constant	3.9719 (34.49)	5.0635 (26.91)	5.1355 (19.24)	4.7768 (33.82)	6.1673 (25.52)	6.9769 (17.60)
Age	0.2636 (43.06)	0.2387 (21.77)	0.2419 (17.68)	0.2003 (24.46)	0.1532 (10.81)	0.1256 (5.98)
Age^2	–0.0032 (–38.17)	–0.0027 (–18.54)	–0.0026 (–15.70)	–0.0022 (–20.58)	–0.0018 (–9.56)	–0.0014 (–5.22)
R^2	0.3817	0.3302	0.2413	0.2360	0.0857	0.0434
F	1,191.4535	357.6002	223.1270	489.5357	75.6706	26.2546
N	3,858	1,448	1,398	3,165	1,595	1,115

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-8

Regression results for schooling level and employment income, by gender, British Columbia, 1985[1]

	Males			Females		
	Secondary incomplete	Secondary certificate	Bachelor's degree	Secondary incomplete	Secondary certificate	Bachelor's degree
Variable:						
Constant	3.6884 (32.61)	4.9331 (27.52)	4.8651 (16.76)	4.3893 (30.77)	6.3978 (29.32)	6.5328 (16.06)
Age	0.2834 (45.02)	0.2392 (24.29)	0.2355 (16.54)	0.2104 (26.24)	0.1237 (10.30)	0.1389 (6.65)
Age^2	–0.0031 (–36.88)	–0.0027 (–21.73)	–0.0025 (–14.79)	–0.0023 (–22.05)	–0.0013 (–8.68)	–0.0015 (–6.01)
R^2	0.4114	0.2819	0.2110	0.2630	0.0744	0.0501
F	1,437.8828	359.3697	180.1500	550.7685	78.8388	26.5915
N	4,113	1,827	1,341	3,082	1,937	972

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-9

Regression results for bachelor's degree by fields of study, and employment income, by gender, Canada, 1985[1]

	Bachelor's degree	
	Males	Females
Variable:		
Constant	5.0648	5.9776
	(38.80)	(41.29)
Age	0.2387	0.1712
	(48.48)	(25.39)
Age^2	–0.0026	–0.0019
	(–51.81)	(–23.31)
Field of study (education excluded)		
Arts/humanities	–0.6014	–0.3069
	(–4.67)	(–2.57)
Social sciences	–0.7005	–0.1219
	(–5.86)	(–0.97)
Commerce/management	–0.0429	0.3972
	(–0.35)	(2.69)
Pure and biological sciences	–0.4725	0.1355
	(–3.86)	(0.97)
Engineering/applied sciences/technologies	–0.0588	0.2355
	(–0.50)	(0.73)
Health sciences/techniques	–0.0872	0.5669
	(–0.42)	(3.68)
Other	–0.2449	–0.3613
	(–0.41)	(–0.71)
Field of study x age (education excluded)		
Arts/humanities x age	0.0110	0.0024
	(3.32)	(0.75)
Social sciences x age	0.0212	0.0032
	(6.83)	(0.91)
Commerce/management x age	0.0068	–0.0073
	(2.13)	(–1.68)
Pure and biological sciences x age	0.0145	–0.0060
	(4.52)	(–1.51)
Engineering/applied sciences/technologies x age	0.0099	–0.0016
	(3.29)	(–0.16)
Health sciences/techniques x age	0.0076	–0.0098
	(1.48)	(–2.31)
Other x age	0.0001	–0.0014
	(0.003)	(–0.10)
R^2	0.2885	0.1043
F	311.5869	71.1392
N	12,256	9,637

1 *t*-statistics are in brackets.

Source Calculations by the author using the 1986 Census Public Use Sample Tape – Individuals.

Table A-10

Public costs of completed secondary schooling compared with incomplete secondary schooling, Canada, 1985

	Direct costs	Forgone earnings		Total	
		Males	Females	Males	Females
	(Dollars per student)				
Region					
Atlantic	13,194	4,031	3,238	16,625	15,832
Quebec	19,707	3,957	3,386	23,064	22,493
Ontario	16,692	4,565	3,838	20,657	19,930
Manitoba and Saskatchewan	15,846	5,367	3,994	20,613	19,240
Alberta	16,983	5,516	4,183	21,899	20,566
British Columbia	14,827	4,250	3,255	18,497	17,502
Canada	16,773	4,925	3,883	21,098	20,056

NOTE Total costs are the sum of direct costs and forgone earnings. Public direct costs are the sum of nonfee costs (Table 2) and public expenditures per student (Table 3) multiplied by the number of years of study. Private direct costs are the sum of nonfee costs (Table 2) and fees (Table 3) multiplied by the number of years of study. Forgone earnings are computed using the equations of Table A-1 to A-8 and the appropriate ages and lengths of schooling as follows:

Level	Length of study (years)	Age
Elementary	6	6-11
Secondary	6	12-14 (incomplete) 12-17 (complete)
College	3	18-20
Bachelor's	4	18-21
Master's	2	22-23
Ph.D.	4	24-27

SOURCE Calculations by the author.

Table A-11

Private costs of completed secondary schooling compared with incomplete secondary schooling, Canada, 1985[1]

	Direct costs	Forgone earnings		Total	
		Males	Females	Males	Females
	(Dollars per student)				
Region					
Atlantic	600	4,031	3,238	4,631	3,838
Quebec	600	3,957	3,386	4,557	3,986
Ontario	600	4,565	3,838	5,165	4,438
Manitoba and Saskatchewan	600	5,367	3,994	5,967	4,594
Alberta	600	5,516	4,183	6,116	4,783
British Columbia	600	4,250	3,255	4,850	3,855
Canada	600	4,925	3,883	5,525	4,483

1 Assuming summer employment of 2 months.
Source Calculations by the author.

Table A-12

Private and public costs of community college, master's degree and Ph.D., Canada, 1985

	Direct costs	Forgone earnings		Total	
		Males	Females	Males	Females
	(Dollars per student)				
Private costs					
Community college	2,211	10,985	8,616	13,196	10,827
Master's degree	4,402	10,931	9,942	15,333	14,344
Ph.D.	8,804	32,054	25,123	40,858	33,927
Public costs					
Community college	21,903	10,985	8,616	32,888	30,519
Master's degree	45,510	11,099	10,041	56,609	55,551
Ph.D.	213,324	34,675	26,165	247,999	239,489

Source Calculations by the author.

Table A-13

Public costs of a bachelor's degree compared with completed secondary schooling, Canada, 1985[1]

	Direct costs	Forgone earnings		Total	
		Males	Females	Males	Females
	(Dollars per student)				
Region					
Atlantic	59,120	10,793	7,080	69,913	66,200
Quebec	53,984	13,517	11,512	67,501	65,496
Ontario	53,700	13,562	10,531	67,262	64,231
Manitoba and Saskatchewan	58,932	16,902	13,070	75,834	72,002
Alberta	66,688	15,995	12,748	82,683	79,436
British Columbia	62,896	14,178	10,918	77,074	73,814
Canada	56,076	14,011	10,675	70,087	66,751

1 Assuming summer employment of 4 months.
Source Calculations by the author.

Table A-14

Private costs of a bachelor's degree compared with completed secondary schooling, Canada, 1985[1]

	Direct costs	Forgone earnings		Total	
		Males	Females	Males	Females
	(Dollars per student)				
Region					
Atlantic	9,281	10,793	7,080	20,074	16,361
Quebec	5,217	13,504	11,512	18,721	16,729
Ontario	8,786	13,535	10,531	22,321	19,317
Manitoba and Saskatchewan	8,076	16,841	13,070	24,917	21,146
Alberta	7,958	15,897	12,748	23,855	20,706
British Columbia	10,226	14,145	10,918	24,371	21,144
Canada	8,255	13,979	10,675	22,234	18,930

1 Assuming summer employment of 4 months.
Source Calculations by the author.

Table A-15

Private and public costs of a bachelor's degree by field of study compared with completed secondary schooling, Canada, 1985[1]

	Direct costs	Forgone earnings		Total	
		Males	Females	Males	Females
	(Dollars per student)				
Private costs					
Education	7,763	13,979	10,675	21,742	18,438
Humanities	7,841	13,979	10,675	21,820	18,516
Social sciences	7,841	13,979	10,675	21,820	18,516
Commerce	7,710	13,979	10,675	21,689	18,385
Pure sciences	7,749	13,979	10,675	21,728	18,424
Engineering	8,307	13,979	10,675	22,286	18,982
Health sciences	9,279	13,979	10,675	23,258	19,954
Health degree	13,810	24,123	17,457	37,933	31,267
Public costs					
Education	38,604	14,011	10,675	52,615	49,279
Humanities	38,604	14,011	10,675	52,615	49,279
Social sciences	38,604	14,011	10,675	52,615	49,279
Commerce	38,604	14,011	10,675	52,615	49,279
Pure sciences	73,548	14,011	10,675	87,559	84,223
Engineering	73,548	14,011	10,675	87,559	84,223
Health sciences	178,380	14,011	10,675	192,391	189,055
Health degree	267,570	24,292	17,457	291,862	285,027

1 Assuming summer employment of 4 months.

Source Calculations by the author.

Notes

1 Using the terms of the 1986 Census Public Use Sample Tape, this is the sum of the WAGESP and SELFIP variables.

2 In the case of the Atlantic region, we could have regrouped only the Maritime provinces, or even only Nova Scotia and New Brunswick, but this would have been at the cost of excluding Newfoundland in both cases and P.E.I. in the second.

3 *Canadian Economic Observer*, Historical Statistical Supplement, 1989/90, Statistics Canada (11-210), Table 1.3, p. 7 for real GDP growth rates and Table 2.6, p. 34 for unemployment rates.

4 The following starting ages are used: elementary completed: 12; secondary incomplete: 15; secondary completed: 18; college: 21; university, bachelor's degree: 22; university, health degree: 24; university, master's degree: 24; university, Ph.D. degree: 28. (The term "college" encompasses community colleges and CEGEP.)

5 The differential – positive or negative – between subsistence costs for a student and a nonstudent, should be included, but is not because the data are not available.

6 *Financial Statistics of Education 1985-1986*, Statistics Canada (81-208), Table 12, Item E (expenditures per student), 1986 entry. Expenses for the Atlantic and Prairies region are a weighted sum of these amounts; the weight is school enrollment (see note 16).

7 *Elementary-Secondary School Enrollment 1985-86*, Statistics Canada (81-210), Table 5, Subtotals grades 1-6 and special (primary) and grades 7-13 and special (secondary).

8 This is the ratio calculated for Ontario for 1985 (*Education Statistics Ontario 1987* Table 1.35 p. 21). This is the only province for which we found this information. Constantatos and West (1991) report that the ratio of secondary to primary costs is 1.3, according to "consultation with Canadian education authorities" (p. 8). This ratio is 0.77 in our terms.

9 *Education in Canada 1986-1987*, Statistics Canada (81-229). Data on expenditures are from Table 42. Where provincial data were missing for 1985-86, they were computed by multiplying provincial data for 1984-85 by the change from 1984-85 to 1985-86 in figures for Canada. Data on enrollment are from Table 8 (total, 1985-86). The ratio 1/3 is used to recognize the fact that part-time students are less costly than full-time students.

10 As represented by Basic Income Units (B.I.U.). See Stager (1989) for more on this. This appears to be the only source on relative costs by level/field of university studies available for Canada.

11 *Universities Enrollment and Degrees 1985*, Statistics Canada (81-204). Data for bachelor's degrees are from Table 7, master's degrees from Table 9, and Ph.D.s from Table 10. Part-time enrollment is converted to full-time equivalents by multiplying it by 1/3. Enrollment in bachelor's-level studies in education, the humanities, commerce, social sciences, and mathematical and natural sciences is given by the sum of lines 2, 3, 4, 5, 15 and 29 minus 35; enrollment in engineering is given by the sum of lines 38 and 55; and enrollment in health is given by the sum of lines 48 and 35 from Table 7. Enrollment in education, the humanities, commerce, and social sciences at the master's level is given by the sum of lines 2, 3, 4, 5 and 15 from Table 9, while enrollment in mathematical and pure sciences, engineering, and health at the master's level is given by subtracting the previous total from line 1 of that table

12 Total costs are from *Education in Canada 1986-1987*, Statistics Canada (81-229), Table 42. Missing data for 1985-86 were calculated as in the case of community colleges.

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